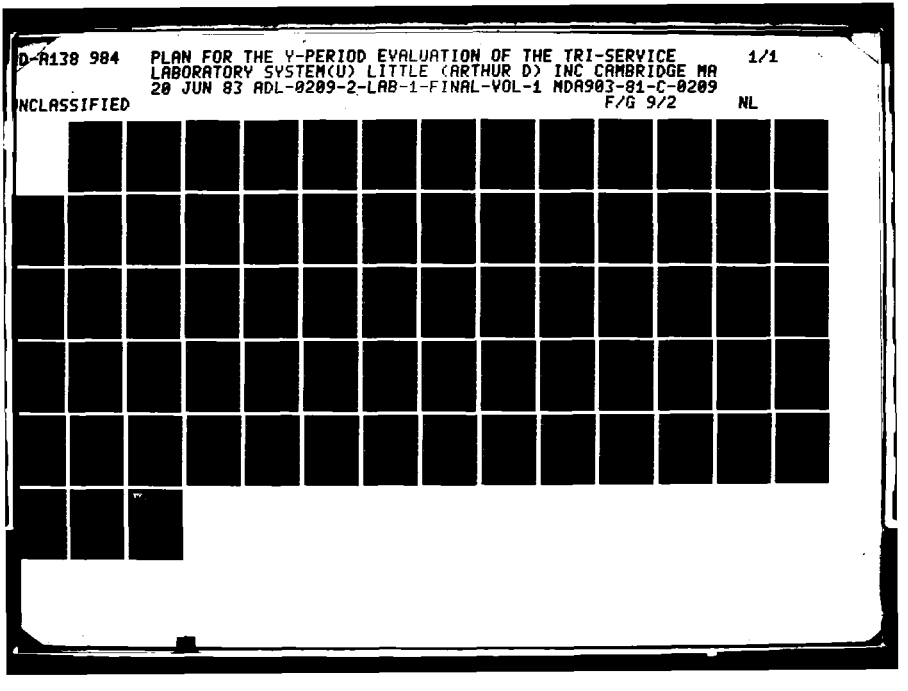
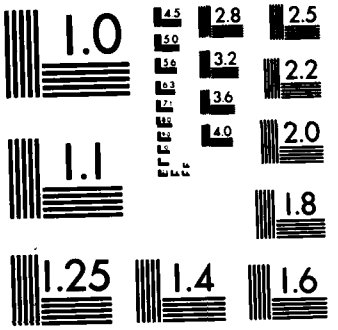

D-A138 984 PLAN FOR THE 4-PERIOD EVALUATION OF THE TRI-SERVICE LABORATORY SYSTEM(U) LITTLE (ARTHUR D) INC CAMBRIDGE MA 20 JUN 83 ADL-0209-2-LAB-1-FINAL-VOL-1 MDA903-81-C-0209
1/1
UNCLASSIFIED
F/G 9/2
NL



(3)

0209-2-LAB-YP-FINAL

PLAN FOR THE Y-PERIOD EVALUATION OF THE TRI-SERVICE LABORATORY SYSTEM

ARTHUR D. LITTLE, INC.
Acorn Park
Cambridge, Massachusetts 02140

June 20, 1983

Report for Period 9/2/82-6/20/83

Prepared for

TRIMIS Program Office
5401 Westbard Avenue
Bethesda, Maryland 20816

SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

REPORT DOCUMENTATION PAGE

READ INSTRUCTIONS BEFORE COMPLETING FORM

1. REPORT NUMBER 0209-2-LAB-1-FINAL	2. GOVT ACCESSION NO AD-A138 984
3. RECIPIENT'S CATALOG NUMBER	
4. TITLE (and Subtitle) Evaluation Plan for the Y Period Evaluation of the Tri-Service Laboratory System	5. TYPE OF REPORT & PERIOD COVERED Evaluation Plan for Y Period 9/?/82-6/20/83
	6. PERFORMING ORG. REPORT NUMBER 86290
7. AUTHOR(s) Arthur D. Little, Inc.	8. CONTRACT OR GRANT NUMBER(s) MDA-903-81-C-0209
9. PERFORMING ORGANIZATION NAME AND ADDRESS Arthur D. Little, Inc. Acorn Park Cambridge, MA 02140	10. PROGRAM ELEMENT, PROJECT, TASK AREA & WORK UNIT NUMBERS
11. CONTROLLING OFFICE NAME AND ADDRESS TRIMIS Program Office 5401 Westbard Avenue Bethesda, MD 20816	12. REPORT DATE June 20, 1983 13. NUMBER OF PAGES 70
14. MONITORING AGENCY NAME & ADDRESS(if different from Controlling Office)	15. SECURITY CLASS (of this report) 15a. DECLASSIFICATION/DOWNGRADING SCHEDULE

16. DISTRIBUTION STATEMENT (of this Report)

Approved for Public Release, Distribution Unlimited

17. DISTRIBUTION STATEMENT (of the abstract entered in Block 20, if different from Report)

18. SUPPLEMENTARY NOTES

19. KEY WORDS (Continue on reverse side if necessary and identify by block number)

Evaluation, Automation, Laboratory

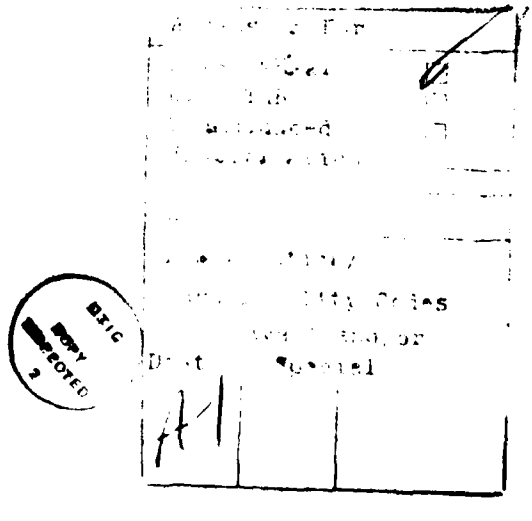
20. ABSTRACT (Continue on reverse side if necessary and identify by block number)

Evaluation plan for conduct of the Post-implementation (Y Period) study of the Tri-Service Laboratory System at Naval Regional Medical Center Oakland, Wright Patterson Medical Center and Regional Hospital and Dwight D. Eisenhower Army Medical Center.

DD FORM 1 JAN 73 1473 EDITION OF 1 NOV 65 IS OBSOLETE

SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

TABLE OF CONTENTS



I. INTRODUCTION

A. BACKGROUND

The Tri-Service Medical Information Systems (TRIMIS) Program Office (TPO) has installed a computer system (the Tri-Service Laboratory System or TRILAB) in three military hospitals:

- Naval Regional Medical Center (NRMC) Oakland, California;
- Dwight D. Eisenhower Army Medical Center (DDEAMC), Ft. Gordon, Georgia; and
- Wright Patterson Medical Center and Regional Hospital (Wright Patterson), Dayton, Ohio.

The experience with these installations is being evaluated to provide information for use in decision making about the future use of automation in clinical laboratories in other military health care facilities.

The first installation was scheduled for NRMC Oakland, which was chosen as the primary evaluation site for the TRILAB system. The evaluation plan for the TRILAB system was developed by Analytic Services, Inc. (ANSER)([1]) who also collected the baseline data at Oakland during an eight-week period (September 29, 1980- November 29, 1980).

In addition to the comprehensive evaluation conducted at NRMC Oakland, "mini-evaluations" at the other two sites (DDEAMC and Wright Patterson) were subsequently undertaken. Baseline data, using self-administered questionnaires, were collected by Arthur D. Little, Inc. at these two sites in the fall of 1981.

After review and evaluation of the data collected at NRMC Oakland, it was decided to supplement the baseline data collected there with additional data from DDEAMC on two important areas of TRILAB impact: turnaround times for laboratory tests and volume of telephone calls inquiring about test results. This supplementary baseline data collection was carried out by Arthur D. Little, Inc., during June of 1982.

Thus four separate evaluation activities were planned at the three TRILAB sites:

- a full-scale evaluation in the clinical laboratory NRMC Oakland,
- a focused evaluation (at a lower level of effort) to document experience at another site and to supplement quantitative information from NRMC Oakland,
- a survey of attitudes of users of clinical laboratory services and clinical laboratory personnel at Wright Patterson, and
- a survey of attitudes of users of clinical laboratory services and clinical laboratory personnel at DDEAMC.

The system at Eisenhower, the last of the three facilities to implement TRILAB, had not reached stability and complete implementation at the time of the post-implementation evaluation. It was therefore decided not to include Eisenhower in the post-implementation evaluation, except for implementation monitoring and interviews. Based on the finding of the implementation monitoring, it was anticipated that the results from Eisenhower would be consistent with the evaluation conclusions based on the other two sites.

Each evaluation activity was intended to be conducted in two phases, one to document the process and measure indicators of service effectiveness before the system was implemented (baseline or X Period), and another to assess the same aspects of laboratory operations after the TRILAB system had been implemented (Y Period). The results of the baseline data collection were summarized in the report "X Period Evaluation of the TRILAB System."[2]

This report presents the plan for the Y Period evaluation. The report is arranged as follows. The remainder of this chapter presents a brief description of the TRILAB system and an overview of the TRILAB objectives and evaluation approach. Chapter II presents the plan for the Y Period evaluation. Appendix A presents details of the original evaluation plan. Appendix B presents the data collection forms to be used at NRMC Oakland, the first site planned for Y Period data

collection. These forms were pretested in conjunction with the implementation monitoring visit to NRMC Oakland during the week of August 15, 1982. Modifications were made to the forms as necessary.

B. DESCRIPTION OF TRILAB

The TRILAB system is designed to support the following laboratory activities: patient registration, test request entry, specimen accessioning and control, work document preparation, quality control, test result entry, inquiry and data retrieval, test result reporting, and management reporting. The registration function will be provided by an interface with the TRI-Service Patient Administration System (TRIPAD) when it is available.

The TRILAB system is designed to have automated, high-volume test instruments on-line, with the goal of significantly reducing clerical work of laboratory technicians and transcription errors. The system is also designed to monitor quality control samples in order to check for correct calibration of instruments and proper handling of the specimens within the laboratory, and to produce interim test results reports, daily cumulative reports, and cumulative summary discharge reports.

In addition, the system produces management information, such as laboratory workload summary reports, which should reduce the effort to prepare management and UCA reports and assist in the efficient organization and administration of the laboratory.

The TRILAB system, which was obtained from Centennial Systems Corporation, was designed as a freestanding laboratory information system, that may also operate as an integrated subsystem of a composite hospital computer system. The system can support terminals outside the laboratory, such as in wards, clinics and satellite facilities for transmission of results and for inquiry as to test status.

C. TRILAB SYSTEM OBJECTIVES

The TRILAB system is generally intended to impact effectiveness and economy of the clinical laboratory. Seventeen specific objectives for TRILAB were identified by the Medical Review Group. These can be grouped into four broad categories of impact:

1. Service Performance

- The availability of laboratory services should be perceived by health care providers to increase.
- Health care providers should perceive an improvement in the legibility of laboratory reports.
- Health care providers will perceive that test order entry is being performed acceptably.
- The time between the initiation (time specimen is supposed to be collected) of a laboratory request and the receipt of results by health care providers should decrease.
- The average number of return visits attributable to lack of laboratory results should decrease.
- The number of STAT laboratory requests that represent other than life-threatening requests should change.
- Health care providers should perceive an improvement in the availability of laboratory data.
- Laboratory technicians should perceive an improvement in specimen control and work organization.
- Health care providers should perceive an increase in usability (convenience and practicability of laboratory reports).

2. Service Capability

- The operational capacity of the laboratory service by time of day and day of week should increase.

3. Use of Resources

- The productivity of laboratory personnel should increase.
- The number of man-hours worked by and associated costs of clerical personnel inside the laboratory, normalized by workload, should decrease.
- The number of man-hours worked by and associated costs of professional personnel employed outside the laboratory in tasks related to the laboratory, normalized by workload, should decrease.

- The number of man-hours worked by and associated costs of technical personnel inside the laboratory, normalized by workload, should change.
- The number of man-hours worked by and associated costs of clerical personnel outside the laboratory in tasks related to the laboratory, normalized by workload, should change.
- Non-personnel operating costs of the laboratory, normalized by workload, should change.

4. Satisfaction/Acceptance

- Physicians and nurses should report acceptance of the Tri-Service Laboratory System.

D. TRILAB EVALUATION PLAN

The evaluation plan for the TRILAB system, developed by Analytic Services, Inc. (ANSER)[1] described 36 hypotheses regarding the potential impacts of TRILAB on the clinical laboratory and MTF. These were grouped into the following four areas:

- personnel time,
- satisfaction and perception,
- information attributes, and
- cost.

The evaluation called for a before-and-after study comparing manual laboratory operation with operation of the laboratory using the TRILAB computer system. Two periods of data collection were planned: the X Period under manual operation before the installation of TRILAB, and the Y Period when TRILAB is operational.

This before-and-after approach was followed in the plans for all the TRILAB evaluations. The elements to be measured, the data collection techniques, and the data obtained at each site, are summarized in Table A-1 of Appendix A, which also contains details of the original evaluation methodology.

Four types of data were collected by ANSER during the baseline study at NRMC Oakland:

- time spent by personnel within the laboratory in information handling activities (using work sampling and timed observations);
- performance of services (turnaround time for test results in the laboratory; transcription discrepancies; number of telephone inquiries about test results; and patient waiting time);
- staff perceptions of performance of services (staff questionnaire survey); and
- staff and patient satisfaction (staff and patient questionnaire survey).

At DDEAMC, two types of quantitative information were obtained on performance of services:

- turnaround time for laboratory tests, and
- number of inquiries to the laboratory about test results.

As shown in Table A-1, the methodology used to collect data at DDEAMC involved some modifications to the original evaluation plan. AT NRMC Oakland, only turnaround time within the laboratory (processing time) was measured. At DDEAMC, total turnaround time from receipt of requisition at the laboratory reception desk to receipt of the test result by the requesting ward or clinic was measured, in addition to laboratory process time. At DDEAMC, the turnaround times for four specific high-volume tests (SMAC, glucose, CBC and urinalysis) were noted separately, from the overall turnaround time. The data on telephone inquiry volume collected at DDEAMC also differed from that collected at NRMC Oakland in that the volume of calls received during the evening and night shifts was measured in addition to the volume for the day shift.

The questionnaire surveys carried out at Eisenhower and Wright Patterson were similar to those carried out at NRMC Oakland, with some modifications made to the survey instruments, e.g., to reflect the fact that Wright Patterson previously had a laboratory computer system (AFCLAS).

II. Y PERIOD EVALUATION PLAN

A. INTRODUCTION

This section presents the Y Period evaluation plan. The plan was developed with the following considerations:

1. In order to utilize the baseline data to the maximum extent, and to make the before-and-after comparison as consistent and meaningful as possible, the same evaluative measures, data collection methodologies, and data collection instruments used in the X Period study were also used in the Y Period study to the extent possible. It was necessary, however, to modify the data collection methodology and instruments in several instances, in view of the differences in procedures in the laboratory because of the TRILAB system.
2. Sample sizes were chosen to provide as reliable as possible data, given the baseline data available from the X Period evaluation.[2,3]
3. Where baseline data was unavailable or was insufficient for evaluative purposes, we attempted to collect such information via interviews and review of any available reports.

Table 1 summarizes the relationship between the evaluation elements and the data obtained in the study. A similar table summarizing the approach followed in the X Period is presented in Appendix A for comparison.

The Y Period data collection plan was organized under the following data collection methodologies:

1. Work sampling program at NRMC Oakland, to collect data on distribution of laboratory personnel activities in the Y Period for comparison with distribution of activities in the X Period. The major objective was to determine whether time spent in information handling activities had changed.

TABLE 1

TRILAB EVALUATION ELEMENTS AND DATA COLLECTION METHODS
POST-IMPLEMENTATION EVALUATION

Element	Data to be Obtained	Data Collection Methodology	Data Obtained NRMC Oakland	Data Obtained Wright Patterson	Data Obtained Eisenhower
Personnel Time Devoted to Information Handling	Time devoted to information activities, e.g. accessioning, logging, result preparation in:				
• Laboratory	Chemistry Hematology Bacteriology	Work sampling	Percent of time and man-hours per week by activity type	Perceptions	Estimates
• Provider Staff Time	Time saved due to TRILAB	Interviews	Estimates of time saved	Estimates	Estimates
Performance of Services					
• Turnaround Time	Time from requisition to result availability	Computer Inquiry	Laboratory process times for Chemistry tests (routine and STAT) Hematology tests (routine and STAT) Bacteriology tests		
• Transcription discrepancies	Number of transcription discrepancies	Interviews with laboratory supervisory staff	Estimates of changes in errors	Perceptions	Estimates
• Laboratory Inquiries	Volume and type of telephone calls to laboratory	Monitoring and categorizing of calls	Volume of telephone calls by type (day shift, weekdays)		
Staff Perceptions of Laboratory Services	Perceptions of providers, nursing and laboratory staff	Self-administered questionnaire	Perception ratings using Likert scale	Perception ratings using Likert scale	
Staff and Patient Satisfaction with Laboratory Services	Staff and patient satisfaction with laboratory services	Self-administered questionnaire	Satisfaction rating using Likert scale	Satisfaction rating using Likert scale	

2. Surveys of laboratory staff, providers, and patients, at NRMC Oakland and Wright Patterson, to determine whether satisfaction with clinical laboratory services had changed.
3. Turnaround time study at NRMC Oakland to determine whether turnaround process times for return of test results had changed.
. Volume of telephone calls to the laboratory at NRMC Oakland, to determine whether changes had occurred in volume of telephone inquiries to the laboratory as a result of the availability of results via the TRILAB system.
5. Interviews and supplementary data collection at the three sites, to obtain cost data, volume data, and other information.

B. WORK SAMPLING OF LABORATORY ACTIVITIES (NRMC Oakland)

In the X Period baseline survey, the time spent by laboratory personnel in information handling activities within the laboratories was measured by an extensive work sampling program in the three major laboratory sections: Hematology, Chemistry, and Bacteriology. Fifteen information handling activities were defined for work sampling purposes (these activities are described in the Appendix to the baseline plan).[1] Data were collected only during the daytime (primarily from 0700-1600) and during the weekdays.

In order to determine whether the amount of staff time devoted to information handling activities had changed as a result of TRILAB, a similar work sampling program was conducted in the three laboratory sections in the Y Period study, focusing on these same activities. Several related computer-assisted activities were added to the data collection instrument to capture the time spent performing computer functions (Form YLAB-1). The data collection instrument was sufficiently general that the same instrument could be used in the three sections. The section sampled is identified on the form. (The activities and definitions are in Appendix C.)[5])

For comparability, work sampling was conducted during the day shift, Monday through Friday (when 75 percent of the work is performed). Two complete weeks of work sampling were planned since it was estimated this would provide sufficient data to determine whether significant (25 percent) changes had taken place in the amount of time devoted to information handling activities.

The Y Period data collection in the three laboratory sections required the equivalent of one data collector per section for two weeks, 8 hours per day, 5 days per week, with 5-minute sampling intervals to obtain the desired sample size. This required data collectors, at times, to follow up to 18 laboratory personnel. The pretest indicated that this was feasible.

In addition to work-sampling activities, data collectors recorded information on staffing and volume of tests by type of test as well as section, day, and time of observation. A separate staffing and workload fact sheet (Form YLAB-2) was completed for each day.

The previous contractor had originally planned to perform work sampling in the reception area, as well as in the laboratory sections. The method of observation, however, was changed to timed observations. The timed observations were ambiguous since it was not clear if they represent 100 percent of the total activities that occurred during a given period of time, so that it is not possible to determine the total time devoted to each activity.

Because of the difficulty in interpreting the baseline time observations, work sampling was not used in this area for the Y study. Instead, data was obtained on staffing changes in the reception area by interviews.

QUESTIONNAIRE STUDY

In the baseline study questionnaires were distributed to the following groups of personnel at the three hospitals: medical staff (MDs and dentists); nurses, administrative, corpsmen and clerical staff; laboratory staff; and patients. The purpose of the questionnaires was to determine the degree of satisfaction of various providers, staff and patients with regard to their interaction with laboratory operations

In order to determine whether the degree of satisfaction and perceptions with regard to laboratory operations changed, a questionnaire survey was again undertaken at two sites. Because many of the questions in the baseline questionnaires at NRMC Oakland did not appear to relate to the potential impact of the TRILAB system, the questionnaire was revised, in order to eliminate unrelated questions, and to include questions related to the specific impact of the TRILAB system. Where possible, those questions from the baseline survey have been retained so that direct comparisons can be made in some areas.

The revised questionnaires are contained in Appendix B (Questionnaire A; Questionnaire B; and Questionnaire C). As noted, they included questions which dealt directly with TRILAB objectives, including:

- perception of laboratory services availability;
- legibility of laboratory reports;
- availability of laboratory data;
- acceptance of TRILAB by physicians and nurses; and
- satisfaction with laboratory reports.

The distribution of the Y Period survey questionnaires was comparable to that of the baseline survey. Three different sets of questionnaires were sent, as in the baseline evaluation, to:

Questionnaire A: all physicians, all nursing staff; all administrative, clerical and corpsmen;

Questionnaire B: all laboratory staff;

Questionnaire C: a sample of 200 outpatients.

As was done in the baseline survey, the survey instruments were sent through the hospital's internal mail service to the hospital personnel, who were requested to complete the forms, seal them in pre-addressed envelopes and return them to a designated office.

The patient questionnaires were distributed randomly during the data collection period to patients in four high-volume clinics:

- Family Practice;
- Internal Medicine;
- OB/GYN; and
- Primary Care.

D. TURNAROUND TIME (NRMC Oakland)

An important measure of laboratory performance is the turnaround time between collection of laboratory specimens, and provision of test results to requesting providers. As discussed in prior reports, the baseline survey at NRMC Oakland collected data on "process time" within the laboratory; that is, the time between when the request slip was received in the laboratory and the time: (a) results were phoned to the requester in the case of emergency/urgent/STAT requests; and (b) the time the completed slip was placed in the outbox to be picked up by staff from wards and clinics, for routine requests.

At NRMC Oakland, data on process time was collected for comparison with the baseline process times. The following times were noted:

- for STAT/urgent requests, the time between receipt of a request and specimen by the laboratory and the time the results were transmitted via terminal to the requester;
- for routine requests, the time between receipt of request and specimen and availability of the result via terminal inquiry;
- the time between the receipt of the request and specimen, and the time the "daily interim report" was available from the data processing department, for those wards which receive these reports (generally those which have pre-op patients); and
- the time between receipt of the request and specimen by the laboratory, and the time the hard-copy results were available in the laboratory for pick up by clinic and ward personnel.

Because of the major differences in the way results are returned from the laboratory to the clinics and wards in the Y Period, the method by which the turnaround process times were collected was different from that of the X Period.

1. STAT Turnaround Time

The computer system captures both the time (date and time of day) "received" (the accession time), and the time that the result has been verified and is transmitted to the requesting ward or clinic (a "beep" is produced at the appropriate clinic or ward terminal when the result is available). These times are not printed, but are available via terminal inquiry.

The turnaround time was collected by reviewing an appropriate sample of requisitions, noting the time received in the laboratory and the accession number, and then obtaining the time the result was available for the appropriate accession number, via terminal inquiry. Arrangements were made to use a terminal that was not in use, or to do the look-up during off-hours.

2. Routine Results Turnaround and Time

Similarly, a sample of routine requisitions was reviewed and the time received in the laboratory noted. The time the results were available was determined via terminal inquiry.

3. Interim Report Results Turnaround Time

The daily interim reports include the results and the date and time that the request was "received." (Some of the result reports also include the date and time of "collection"; time "received" is typically about a half-hour after the collection time.) The date and time of the computer print run is also noted on the report. To collect the turnaround time data for the daily hard-copy interim reports, the relevant data from a sample of interim reports were transferred onto the data collection form. This was done by copying the print end times and the time the reports were picked up from the log kept at the front desk of the data processing center.

4. Daily Summary Reports Turnaround Time

A similar procedure was followed to obtain the print end and report pick-up times for daily summary reports.

Table 2 lists the planned process time sample sizes for the Y Period data collection. They were based on our analysis of the X Period data. Except for Hematology routine results, the sample sizes proposed at NRMC Oakland were larger than those collected in the X Period.

TABLE 2

TURNAROUND TIME SAMPLE SIZE

	X Period	Y Period
Routine		
Chemistry	51	100
Hematology	250	220
Microbiology	16	35
STAT		
Chemistry	33	50
Hematology	62	75

The data collection form utilized and the definition of data elements are presented in Appendix B (Form YLAB-3).

E. NUMBER OF TELEPHONE CALLS TO THE LABORATORY

Another important measure of laboratory performance is the volume of telephone inquiries to the laboratory for information about test status. Such inquiries not only take up time of both requesters and laboratory personnel, but also disrupt work flow and affect providers' perceptions of the quality of laboratory services and reflect on the ability of the laboratory to provide results when required.

In the X Period study at NRMC Oakland, the number of calls received by the laboratory was monitored over a period of seven days (Monday through Friday, primarily 0700-1600).

During the Y Period study the number of calls received was monitored in order to determine the extent to which the number of calls to the laboratory changed as a result of the inquiry capability of the terminals on wards and clinics. Monitoring of telephone calls was carried out using procedures similar to those utilized in the X Period.

At NRMC Oakland, an observer was stationed at the reception desk to monitor both the number and type of calls received. Calls were categorized as:

- calls requesting information from filed results in the reception area;
- calls requesting information via terminal look-up;
- calls requesting information from the laboratory;
- calls requesting a laboratory chief or supervisor by name;
- calls requesting a laboratory technician by name (other than supervisor); and
- calls requesting general information.

In the baseline study, a total of 615 calls were monitored, equivalent to 102.5 calls per (8-hour) day. This number of calls was determined sufficient to detect a 10 percent change in calls requesting information from the laboratory (for the day shift, Monday through Friday). In the Y Period study, the equivalent of two weeks' calls was monitored. The form utilized to capture the data on telephone calls is appended (From YLAB-4).

F. PATIENT WAITING TIMES

Change in patient waiting time was not an objective of the TRILAB system (see Section II-C). However, in the baseline study at NRMC Oakland, data were collected on the waiting times experienced by patients at the laboratory reception desk to have their blood drawn, in anticipation that additional tasks might be performed at the laboratory reception area which would affect the patient waiting times. This would not occur until centralized accessioning was implemented.

The waiting times experienced by patients are essentially determined by the volume of patients and availability of phlebotomists at any given time, which are not directly affected by implementation of the TRILAB system but rather by general staffing levels. Therefore patient waiting times were not measured in the Y Period study.

G. INTERVIEWS AND OTHER DATA COLLECTION

A series of interviews were conducted at NRMC Oakland and DDEAMC with key laboratory and hospital staff, to supplement the formal data collection effort. These interviews were similar to those carried out during the implementation monitoring visits, and were designed both to obtain a greater understanding of user perceptions, as well as to obtain supplementary data and information. The people interviewed and the topics for discussion are listed below.

Key Laboratory Personnel

- assessment of important TRILAB system impacts;
- problems encountered and issues interfering with benefits realization;
- time spent on management reporting and additional benefits perceived; and
- changes in error rates and duplicate tests.

Key Medical/Clinical Staff

- assessment of important TRILAB system impacts (quantified where possible);
- problems encountered and issues interfering with benefits realization;
- changes in error rates and duplicate tests;
- utilization of flow sheets; and
- changes in results filing procedures.

In order to appropriately compare costs and benefits associated with TRILAB at Oakland, it was necessary to collect data that would allow for normalizing for system workload between the X and Y time periods. Thus data on the following were collected:

Workload

1. copy of the laboratory workload reports by month for FY 1982;
2. staffing of the laboratory during the Y Period;
3. hospital activity: average census and average daily clinic visits.

Computer System Costs

1. Operating Costs
   - ADP equipment;
   - ADP maintenance and software;
   - ADP personnel-- (list of DP personnel and determine percent of time allocatable to TRILAB);
   - space and overhead costs; and
   - consumables.
2. One-time Costs
   - o site preparation;
   - o equipment; and
   - o software.

H. TRANSCRIPTION DISCREPANCY RATE

As discussed previously in the baseline reports[1] the X Period evaluation plan included determining the rate of transcription errors within the laboratory, by checking a copy of the test result slips against the appropriate accession logs, worksheets, the patient's laboratory data flow sheet and the patient's chronological record of medical care. It was planned to note the type of discrepancy (e.g., patient identification data, tests requested, test results) for the cases where the transcription discrepancy occurred.

The data obtained, however, were both difficult to interpret and the sample size was too small to detect even large (50 percent) changes in discrepancy rates. Since there is no useful baseline data on transcription discrepancies at NRMC Oakland, no data on discrepancies was collected in the Y Period study. Instead, estimates of changes in discrepancies were obtained by interviewing supervisory laboratory personnel.

I. RESOURCE REQUIREMENTS

1. NRMC Oakland

It was planned to collect the required data at NRMC Oakland in two to three intensive weeks of data collection during October 1982. The following were the estimated on-site resource requirements. Figure 1 presents the proposed time schedule.

FIGURE I

PROPOSED TIME SCHEDULE

Y PERIOD DATA COLLECTION

NRMC OAKLAND

ACTIVITY	October 29	30	6 - 7	8	15	22	26
Data Collecter Interviews	•						
Data Collector Selection		•					
Copy and Assemble Forms and Surveys		•-----•					
Data Collection: Work Sampling				•----------•			
Telephone Volume				•----------•			
Surveys Mailed				•-----•			
Patient Surveys				•-----•			
Turnaround Times:							
STAT				•-----•			
Routine					•-----•		
Collect Surveys						•	

Data Area	Time Period (weeks)	Number of People	Person-Weeks
Work Sampling	2	4	8
Reception Area Telephone	2	1	1
Turnaround Times	1	1	1
Questionnaire Administration	1	1	1
Back-up	2	1	2
		8	13
Interviews/Supervision (Senior Staff)	2	2	4
TOTAL		10	17

2. Questionnaire Administration

Questionnaire administration during the X Period study at Wright Patterson was carried out by the staff at the hospital. Questionnaire administration was carried out the same way for the Y Period, so that no on-site resources were required.

REFERENCES

(1) "Evaluation Plan (Pre-Period X) for the Tri-Service Laboratory Initial Capability Information System," ANSER Analytic Service, Inc., June 30, 1980.

(2) Baseline Evaluation of the Tri-Service Laboratory System, August 2, 1982.

(3) Review of Baseline Data on Laboratory Services: Annex to X Period Data Collection at NRMC Oakland, February 23, 1982.

(4) ADL Supplemental Data Collection Plan, April 20, 1982.

(5) Description of Non-Computer Activities from Progress Report, Period X Data Analysis for Evaluation of the Tri-Service Laboratory Initial Capability Information System (TRILAB) at the Naval Regional Medical Center Oakland, California, January 1981.

APPENDIX A

ORIGINAL EVALUATION PLAN

APPENDIX A

EVALUATION HYPOTHESES TO BE TESTED
IN THE TRILAB EVALUATION AT NRMC OAKLAND

Element to be Measured	Hypothesis	Data Collection Technique	Data Form	Collection Area
Personnel time to prepare laboratory request forms	A1	Work sampling Timed observations	1	Lab reception area
Personnel time to register patients and perform request order entry	A2	Work sampling	1	Lab reception area
Personnel time to accession lab specimens	A3	Work sampling Timed observations	1 4	All lab sections Blood Bank
Personnel time to prepare and affix specimen labels	A4	Timed observations	3	Lab reception area
Personnel time to prepare worksheets and loadlists	A5	Work sampling	1	All lab sections
Personnel time to do test processing and perform test calculations	A6	Work sampling	1	All lab sections
Personnel time to transcribe and report results	A7	Work sampling Timed observations	1 4	All lab sections Blood Bank
Personnel time to certify test results	A8	Operational Audit	-	Lab management
Personnel time to report and distribute test results	A9	Work sampling Timed observations	1 3,4	All lab sections Lab reception area
Personnel time to file and chart test results	A10	Work sampling Timed observations	1 3,4	All lab sections Lab reception area

Element to be Measured	Hypothesis	Data Collection Technique	Data Form	Collection Area
Personnel time to inquire on test status	A11	Work sampling Operational Audit Timed observations	1 - Self reporting log	Lab reception area
Personnel time to respond to inquiries on test status	A12	Work sampling Timed observations	1 3	All lab sections Lab reception area
Personnel time to compile workload statistics	A13	Work sampling	1	All lab sections
Personnel time to log, calculate and report quality control information	A14	Work sampling	1	All lab sections
Personnel time to produce administrative reports	A15	Operational Audit	-	Laboratory management
Personnel time to prepare cumulative laboratory reports	A16	Operational Audit	-	Laboratory management
Personnel time to maintain the computer system	A17	Work sampling Operational Audit	-	Not applicable to Period X
Personnel time to review medical and administrative management reports	A18	Operational Audit	-	Laboratory management
Personnel time to review patient clinical results	A19	Operational Audit	-	Inpatient wards
Personnel time to administratively handle incoming and outgoing test specimens	A20	Work sampling	1	All lab sections

d	Hypothesis	Data Collection Technique	Data Form	Collection Area
ne in	A21	Timed observations	3	Lab reception area
action oratory	B1	Survey		Laboratory staff
on with rform- P system	B2	Survey		Hopsital staff
staff on with of auto- em per-	B3	Survey		Laboratory staff
aff on with e	B4.1	Survey		Medical staff
aff on with e	B4.2	Survey		Nursing staff
tive and taff on with service	B4.3	Survey		Administrative and clerical staff
e pro- eptions eliness ory	B5.1	Survey		Nursing and medical staff
e pro- eptions l- results ervices	B5.2	Survey		Nursing and medical staff

Element to be Measured	Hypothesis	Data Collection Technique	Data Form	Collection Area
Health care provider perceptions of the readability of lab information	B5.3	Survey		Nusing and medical staff
Health care provider perceptions of the impact of lab services on patient care	B6	Survey		Nursing and medical staff
Health care provider satisfaction with overall performance of ADP system	B7	Survey		Nursing and medical staff
Patient satisfaction with laboratory services	B8	Survey		Patients in laboratory area
Number of lab transcription errors detected	C1	Medical record audit	5	Outpatient MR Inpatient wards
Number of improperly prepared request slips arriving at the lab	C2	Observation	2	All laboratory sections
Turnaround time of laboratory results	C3	Medical record audit	5	Outpatient MR Inpatient wards
Number and distribution of inquiries to the laboratory	C4	Self-reporting log	-	Laboratory reception area
Legibility of lab results	C5	Medical record audit	5	Outpatient MR Inpatient ward
Completeness of the lab portion of medical record	C6	Medical record audit	5	Outpatient MR Inpatient wards

TABLE A-1

EVALUATION ELEMENTS AND DATA COLLECTION METHODOLOGY FOR THE BASELINE EVALUATION OF THE TRI-SERVICE LABORATORY SYSTEMS

Element	Associated Hypotheses[a]	Data to be Obtained	Data Collection Methodology	Data Obtained--NRMC Oakland	Data Obtained--Eisenhower	Data Obtained-Wright Patterson
Personnel Time Devoted to Information Handling	A1-A20	Time devoted to information handling activities, e.g., accessioning, logging, result preparation in:				
		Chemistry Hematology Bacteriology	Work sampling	Percent of time and manhours per week by activity type[b]		
		Blood Bank Reception Area	Timed observations	Percent of time (minutes per activity)--day shift, weekdays		
Service Performance						
• Turnaround Time	C3	Time from requisition to result avialability	Time stamp laboratory requisitions at two points in process	Lab process times for Chemistry tests (routine and STAT) Hematology tests (routine and STAT) Bacteriology tests	Total turnaround time for Chemistry (routine and STAT) Hematology (routine and STAT) Bacteriology tests	
• Transcription Discrepancies	C1,C5,C6	Number of transcription discrepancies	Medical Record Review	Percent of transcriptions with discrepancies		
• Lab Inquiries	C4	Volume and type of telephone calls to laboratory	Monitoring and categorizing of calls	Volume of telephone calls by type (day shift, week days)	Volume of telephone calls (day and night shift, week days)	
• Patient Waiting Times	A21	Waiting times at reception desk	Timed observations of patients waiting in reception area	Average patient waiting time[b]		
Staff Perceptions of Laboratory Services	B5-B8	Perceptions of providers, nursing and lab staff	Self-administered questionnaire	Perception ratings using Likert Scale	Perception ratings using Likert scale	Perception ratings using Likert scale
Patient Satisfaction with Laboratory Services	B1-B4,B7,B8	Patient satisfaction with lab services	Self-administered questionnaire	Satisfaction ratings using Likert Scale	Satisfaction rating using Likert scale	Satisfaction rating using Likert scale

[a] Complete listing in Appendix A.

[b] Data analyzed by Analytic Services, Inc.

APPENDIX B

Y-PERIOD DATA COLLECTION FORMS

Naval Regional Medical Center (NRMC)
Oakland, California
Period Y -- October 1982

Form YLAB-1
WORK SAMPLING SHEET _____
Lab Section _____

Date _____
Name _____

TIME	MANUAL: Verify/Correct Request Forms Accession Specimens	Preparing Work Sheets	Test Processing	Performing Test Calculations	Recording Test Results	Transcribing Test Results	Reporting Test Results	Distributing Test Results	Filing Test Results	Responding to Inquiries on Test Status	Compiling Workload Statistics	Logging, Calculating, and Reporting Quality Control Information	Administrative Handling of Incoming and Outgoing Test Specimens	Other -- Productive	Other -- Nonproductive	Away from Area	COMPUTER-RELATED: Maintain Computer System and Instrument Interface	Accession	Prepare Work Sheets	Results Entry	Results Retrieval	Results Review	Edit File	Number of People	COMMENTS
TOTALS																								

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25

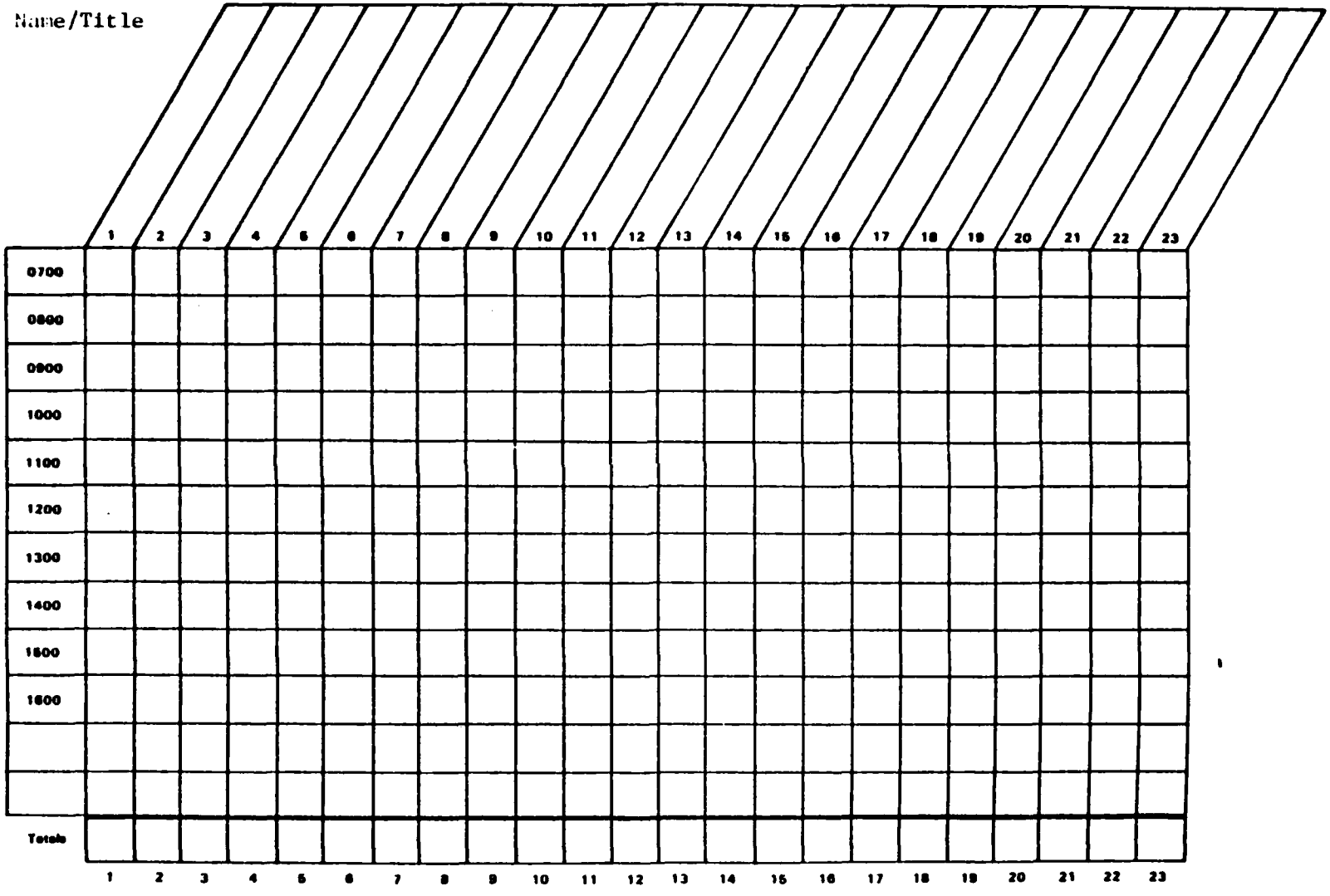
Form YLAB-2

Naval Regional Medical Center (NRMC)
Oakland, California
Period Y -- 1982

WORK SAMPLING STAFFING SHEET

Date _____

Lab Section _____



Form YLAB-3

LAB TURNAROUND TIME

NRMC OAKLAND

COMPARISON OF AVAILABLE RESULTS

VIA TERMINAL AND HARDCOPY

Lab Section_____ Date_____

Test Type: STAT_____ Data Collector_____

Routine_____

ACCESSION #	REQ LOC		MD NAME	ACCESSION date	ACCESSION time	FIRST RESULTS AVAILABLE date	FIRST RESULTS AVAILABLE time	COMPLETE RESLTS AVAILABLE date	COMPLETE RESLTS AVAILABLE time	CRT PROCESS TIME first	CRT PROCESS TIME complete	INTERIM HARDCOPY AVAILABLE date	INTERIM HARDCOPY AVAILABLE time	INTERIM HARDCOPY PROCESS TIME	HARDCOPY AVAILABLE date	HARDCOPY AVAILABLE time	PROCESS TIME	SUMMARY HARDCOPY PICKED UP date	SUMMARY HARDCOPY PICKED UP time	DISTRIBUTION TIME	TOTAL TURNAROUND

EXPLANATION OF FORM YLAB-3

Accession Number -- which includes the lab department, is the number assigned to the lab request and specimen as it appears on the CRT screen.

REQ LOC -- refers to the requesting location of the lab test as it appears on the CRT screen.

MD Name -- Physician name; needed for referencing accession numbers when requesting location is an outpatient clinic.

Accession Data and Time -- refers to the date and time accessioning takes place on the computer upon receipt of a request and specimen by the laboratory department.

First Results Available -- is the date and time the first test results from a specimen are transmitted via terminal (often multiple tests are performed on one specimen and some results are available sooner than others).

Complete Results Available -- is the date and time all test results requested on a single specimen are transmitted via terminal.

CRT Process Time -- is the elapsed time between receipt of a request and specimen by the lab department and the availability of the first and complete results via terminal inquiry.

Interim Hard Copy Available -- indicates the date and time at which the "daily interim hard copy reports" of lab test results are available for pickup in the DP department (primarily used by the pre-op wards).

Interim Hard Copy Process Time -- refers to the time between the receipt of the request and specimen by the lab department and the time the "daily interim report" is available for pickup from the data processing department, for those wards which receive these reports (generally those which have pre-op patients).

Hard Copy Available -- is the date and time the hard copy lab results are available in the data processing department for pick up by clinic/ward personnel (from DP operator log).

Process Time -- refers to the time between receipt of the request and specimen and the time the hard copy results are available in the data processing department for pick up by clinic/ward personnel.

FORM YLAB-4

TELEPHONE INQUIRIES
(Reception Desk)

Date: _____

Time: _____ to _____ Data Collector: _____

Time	Calls Requesting Information from Filed Results in Reception Area	Calls Requesting Information from a Lab Section	Calls Requesting a Lab Chief or Supervisor (by Name)	Calls Requesting a Lab Tech by Name (other than Supervisor)	Calls Requesting General Information
0700-0800					
0800-0900					
0900-1000					
1000-1100					
1100-1200					
1200-1300					
1300-1400					
1400-1500					
1500-1600					
1600-1700					

QUESTIONNAIRE A

To: USERS OF CLINICAL LABORATORY SERVICES

Arthur D. Little, Inc., an independent consulting firm, is under contract with the Department of Defense to evaluate the functional performance of the TRILAB System at this medical treatment facility. Results obtained from this survey will be used in comparison to those obtained from a similar survey which was previously administered at this site.

Your help with this evaluation is greatly appreciated. Please return your completed questionnaire in the enclosed envelope by October 15, 1982.

For Computer Use ___ ___ ___ ___ ___ ___
1 2 3 4 5 6

1. Listed below are characteristics and activities associated with clinical laboratory services. Please indicate how satisfied you are with these attributes as they exist with the TRILAB System by marking an "X" in the column that best describes your opinion.

	Very Satisfied	Somewhat Satisfied	Undecided/ No Opinion	Somewhat Unsatisfied	Very Unsatisfied	
A. TRILAB SYSTEM						
Availability of system	1	2	3	4	5	7
Reliability of system	1	2	3	4	5	8
Accuracy of system	1	2	3	4	5	9
B. ASPECTS OF TEST REPORT FORM						
Clarity of printout	1	2	3	4	5	10
Completeness of results provided by lab reports	1	2	3	4	5	11
Indication of abnormal values on lab reports	1	2	3	4	5	12
Conciseness of results provided by lab reports	1	2	3	4	5	13
C. EFFICIENCY OF TRILAB SYSTEM IN LAB OPERATIONS						
Length of time between ordering STAT inpatient lab tests and obtaining results	1	2	3	4	5	14
Length of time between ordering routine inpatient lab tests and obtaining initial results	1	2	3	4	5	15
Length of time between ordering STAT/ emergency room lab tests and obtaining results	1	2	3	4	5	16
Length of time between ordering routine outpatient tests and obtaining results	1	2	3	4	5	17
Flexibility of lab in handling special cases	1	2	3	4	5	18
Training in ordering and retrieving laboratory information	1	2	3	4	5	19
D. RESULTS						
Accuracy of results with TRILAB	1	2	3	4	5	20
E. INFORMATION STORAGE AND RETRIEVAL						
Access to laboratory results with TRILAB	1	2	3	4	5	21
Access to paper copy for STAT results	1	2	3	4	5	22
Retrieval of previous lab data	1	2	3	4	5	23
Ability to obtain cumulative results for individual patients	1	2	3	4	5	24
Capability of searching entire patient data base for analysis or research	1	2	3	4	5	25
Ease and timeliness of results of laboratory tests	1	2	3	4	5	26

2. Overall, how satisfied are you with the clinical laboratory services provided at this medical center:

Very Satisfied	Somewhat Satisfied	Undecided/ No Opinion	Somewhat Unsatisfied	Very Unsatisfied
1_____	2_____	3_____	4_____	5_____ 27

3. Overall, how satisfied are you with the TRILAB system:

1_____ 2_____ 3_____ 4_____ 5_____ 28

4. Please indicate what you feel is an acceptable turnaround time, (from time of ordering to receipt of results,) for typical lab tests in days, hours, minutes as applicable:

a) STAT inpatient tests

_____hours (29-30) _____minutes (31-32) _____ no opinion (33)
_____don't know

b) Routine inpatient tests

_____days (34-35) _____hours (36-37) _____minutes (38-39) _____ no opinion (40)
_____don't know

c) STAT emergency room tests

_____hours (41-42) _____minutes (43-44) _____ no opinion (45)
_____don't know

d) Routine outpatient tests

_____days (46-47) _____hours (48-49) _____minutes (50-51) _____ no opinion (52)

5. How often would you say the following occurs with the TRILAB system? Please indicate by marking and "X" in the column that best describes your opinion.

	Often	Occasionally	No Opinion	Rarely	Not Applicable
Tests repeated due to delay in filing of original results	1_____	2_____	3_____	4_____	5_____ 53
Tests repeated due to lost results	1_____	2_____	3_____	4_____	5_____ 54
Tests repeated due to results you consider inaccurate	1_____	2_____	3_____	4_____	5_____ 55
Phone calls to lab to obtain results	1_____	2_____	3_____	4_____	5_____ 56
Unnecessary duplication of report data	1_____	2_____	3_____	4_____	5_____ 57

6. Did you work at this facility before TRILAB was installed in February 1982? (check one)

_____ Yes 58

_____ No

(If no please go on to question 7)

If you worked here before TRILAB was installed, please rate the relative frequency of the following events with TRILAB compared to the previous manual lab operations by marking with an "X" in the column that best describes your opinion.

	More Frequently with TRILAB	Similar Frequency with TRILAB	No Opinion/ Undecided	Less Frequently with TRILAB	Never with TRILAB
Tests repeated due to delay in filing of original results	1_____	2_____	3_____	4_____	5_____ 59
Tests repeated due to lost results	1_____	2_____	3_____	4_____	5_____ 60
Tests repeated due to results you consider inaccurate	1_____	2_____	3_____	4_____	5_____ 61
Phone calls to lab to obtain results	1_____	2_____	3_____	4_____	5_____ 62
Unnecessary duplication of report data	1_____	2_____	3_____	4_____	5_____ 63

7. Please indicate how frequently you use the inquiry capability of TRILAB to obtain test results performed within each of the following time frames:

	Often	Occasionally	Undecided	Rarely	Never	
Previous day	1_____	2_____	3_____	4_____	5_____	64
2 - 6 days	1_____	2_____	3_____	4_____	5_____	65
1 - 2 weeks	1_____	2_____	3_____	4_____	5_____	66
Over 2 weeks	1_____	2_____	3_____	4_____	5_____	67

8. (Physicians only). Which of the following categories most accurately describes your use of the clinical laboratory:

_____1. Light (0 to 10 tests/day) 68

_____2. Moderate (11 to 20 tests/day)

_____3. Heavy (21 or more tests/day)

9. For background purposes only, please answer the following questions. 69

a) What is your professional position at this hospital? (check one)

_____1. Administrative Officer

_____2. Administrative Specialist

_____3. Staff Physician

_____4. House Staff Officer (Intern, Resident, or Fellow)

_____5. Dentist

_____6. Medical Student

_____7. Physician's Assistant/Nurse Pract.

_____8. Nurse/LVN, LPN

_____9. Corpsman or Technician

_____0. Registrar

_____(. Clerk

_____Y. Other (Specify_____)

_____Z.

b) In which department are you located (e.g., Cardiology, Pediatrics, etc.) 70-71

_____

c) How long have you been working at this facility? (check one)

_____1. Less than 6 months

_____2. 6-12 months

_____3. 1 to 3 years

_____4. 3 years or more (specify_____) 72

d) Are you in the military?

_____1. Yes

_____2. No 73

We would appreciate any additional comments you might wish to add:

_____

_____

_____

_____

_____

_____ 74

Thank you for taking the time to complete this questionnaire.

linical Laboratory Personnel

D. Little, Inc., an independent consulting firm, is under contract
ne Department of Defense to evaluate the functional performance of the
System at this medical treatment facility. Results obtained from this
will be used in compar son to those obtained from a similar survey
usly administered at this site.

elp with this evaluation is greatly appreciated. Any information
ovide will be kept in strict confidence.

For Computer Use _____
1 2 3 4 5 6

1. Listed below are characteristics and activities associated with clinical laboratory services. Please indicate how satisfied you are with these attributes as they exist with the TRILAB System by marking an "X" under the column that best describes your opinion.

	Very Satisfied	Somewhat Satisfied	Undecided/ No Opinion	Somewhat Unsatisfied	Very Unsatisfied	
A) TRILAB SYSTEM						
Availability of System	1	2	3	4	5	7
Reliability of System	1	2	3	4	5	8
Accuracy of System	1	2	3	4	5	9
B) ASPECTS OF TEST ACCESSIONING						
Ease of test order entry	1	2	3	4	5	10
Ease of generation of specimen label (accuracy, speed)	1	2	3	4	5	11
Clarity of worksheet	1	2	3	4	5	12
C) ASPECTS OF TEST RESULTS REPORT						
Clarity of print-out	1	2	3	4	5	13
Entry of results into system	1	2	3	4	5	14
Inquiry capabiltiy	1	2	3	4	5	15
Availability of hard copy results	1	2	3	4	5	16
Capability of editing files	1	2	3	4	5	17
D) EFFICIENCY OF TRILAB SYSTEM IN LAB OPERATIONS						
Time spent identifying/indicating abnormal values	1	2	3	4	5	18
Time spent on department log	1	2	3	4	5	19
Medical staff familiarity with TRILAB	1	2	3	4	5	20
Adequacy of your training with TRILAB	1	2	3	4	5	21
E) CRT FUNCTIONS/TERMINAL FUNCTIONS						
Legibility of CRT Screen	1	2	3	4	5	22
Efficiency of command functions	1	2	3	4	5	23
Location of terminals	1	2	3	4	5	24
F) RESULTS						
Quality control of data	1	2	3	4	5	25
Accuracy of results	1	2	3	4	5	26
Logging/reporting quality control information	1	2	3	4	5	27

	Very Satisfied	Somewnat Satisfied	Undecided/ No Opinion	Somewnat Unsatisfied	Very Unsatisfied
3) INFORMATION STORAGE AND RETRIEVAL					
Time spent verifying patient ID with TRILAB system	1_____	2_____	3_____	4_____	5_____ 28
Speed/ease of results retrieval	1_____	2_____	3_____	4_____	5_____ 29
Results	1_____	2_____	3_____	4_____	5_____ 30
Capability of providing cumulative results to users	1_____	2_____	3_____	4_____	5_____ 31
2. Overall, how satisfied are you with the TRILAB System?	1_____	2_____	3_____	4_____	5_____ 32
3. Overall, how satisfied are you with clinical laboratory services provided by this medical center?	1_____	2_____	3_____	4_____	5_____ 33

4. Please indicate how frequently you feel the following occurs with TRILAB by marking an "X" under the column that best describes your opinion.

	Often	Occasionally	Undecided/ No Opinion	Rarely	Never
Tests repeated due to lost results	1_____	2_____	3_____	4_____	5_____ 34
Duplication of information	1_____	2_____	3_____	4_____	5_____ 35
Telephone calls to units	1_____	2_____	3_____	4_____	5_____ 36
Time spent on manual record-keeping	1_____	2_____	3_____	4_____	5_____ 37
Time spent phoning STAT results to unit	1_____	2_____	3_____	4_____	5_____ 38
Errors in transcription	1_____	2_____	3_____	4_____	5_____ 39

5. Did you work in this laboratory before TRILAB was installed in February 1982? (check one)

_____Yes

_____No

(If no, please proceed to question 6.) +0

If you worked here before TRILAB was installed please indicate the relative frequency of the following events since TRILAB installation by marking an "X" under the column that best describes your opinion.

	More Frequently with TRILAB	Similar Frequency with TRILAB	Never	Less Frequently with TRILAB	Undecided	
Telephone calling to inpatient units/ outpatient clinics	1_____	2_____	3_____	4_____	5_____	+1
Duplication of information	1_____	2_____	3_____	4_____	5_____	+2
Necessity of repeating tests due to inaccurate results	1_____	2_____	3_____	4_____	5_____	+3
Time spent on manual record keeping	1_____	2_____	3_____	4_____	5_____	+4
Discrepancies in transcription	1_____	2_____	3_____	4_____	5_____	+5

6. Please rank what you feel is the most important improvement with TRILAB

	Very Important	Somewhat Important	Undecided/ No Opinion	Somewhat Unimportant	Very Unimportant	
Format of lab request/results	1_____	2_____	3_____	4_____	5_____	+6
Efficiency of laboratory operations	1_____	2_____	3_____	4_____	5_____	+7
Accuracy of Results	1_____	2_____	3_____	4_____	5_____	+8
Ease of information storage and retrieval	1_____	2_____	3_____	4_____	5_____	+9
Number of telephone calls	1_____	2_____	3_____	4_____	5_____	50

7. Finally, for background purposes, please answer the following:

a) What is your professional specialty? (check one)

_____1. Pathologist/Physician

_____2. Lab Technician

_____3. Receptionist/Clerk

_____4. Lab Student

_____5. Lab Officer

_____6. Other (specify) 51

b) How long have you been working at this facility? (check one)

_____1. Less than 6 months

_____2. 6-11 months

_____3. 1 to 3 years

_____4. 3 years or more (specify _____) 52

c) Are you in the military?

_____1. Yes

_____2. No 53

3. In your opinion, are there any instruments which should be on-line to the TRILAB system, but are not now? Please list below.

_____

_____

_____ 54 55

9. In your opinion, are there any instruments which are currently on-line to TRILAB, but should not be? Please list below.

_____

_____

_____ 57

10. Are there any additional comments you may wish to add:

_____

_____

_____

_____

_____

_____

_____ 58 59

Thank you for taking the time to complete this questionnaire.

QUESTIONNAIRE C

To: Patients

STUDY OF CLINICAL LABORATORY SERVICES

Arthur D. Little, Inc., an independent consulting firm, is under contract with the Department of Defense to evaluate clinical laboratory services at several medical treatment facilities. The results of the evaluation will help improve the operation of military clinical laboratories.

You can help with this evaluation by answering the following questions about the current system. Any information you provide will be kept in strict confidence.

NOTE:

You may be given this questionnaire on more than one visit to the Clinical Laboratory; however, we ask you to fill out only one. If, in fact, you have already completed another copy of this questionnaire, please check the box below and return to questionnaire to the person from whom you received it.

☐ I have already completed another copy of this questionnaire.

For Computer Use _ _ _ _ _ _
1 2 3 4 5 6

Please indicate your answers by placing an "X" next to the response.

	Very Satisfied	Somewhat Satisfied	Undecided/ No Opinion	Somewhat Unsatisfied	Very Unsatisfied	
1. Overall, how satisfied are you with the clinical laboratory services at this Medical center?	1	2	3	4	5	7
2. How satisfied are you with the amount of time you have to wait after you register with the lab receptionist?	1	2	3	4	5	8
3. How satisfied are you with the amount of time you have to wait to be serviced by a lab technician (after registration)?	1	2	3	4	5	9

	Often	Occasionally	Don't Know Not Applicable	Rarely	Never	
4. How often has it been necessary for you to have a test repeated due to lost or bad results?	1	2	3	4	5	10
5. How often have you been delayed at lab reception area due to improper completion of your test request form?	1	2	3	4	5	11

6. For background purposes only, please answer the following questions:

What is your military status? (check one) 12

_____1. Officer

_____2. Enlisted

_____3. Dependent of Active Duty

_____4. Retiree

_____5. Dependent of Retiree

_____6. Civilian

_____7. Other (Specify_____)

I am currently (check one) 13

_____1. An inpatient

_____2. An outpatient

_____3. Other (Specify_____)

7. We would appreciate any additional comments or suggestions for improvements:

_____

_____

_____

_____

_____ 14-15

Thank you for taking the time to complete this questionnaire.

APPENDIX C

WORK SAMPLING ACTIVITIES

C-1 CHEMISTRY

C-2 HEMATOLOGY

C-3 BACTERIOLOGY

APPENDIX C-1

WORK SAMPLING ACTIVITIES

CHEMISTRY SECTION

1. Verify/Correct Request Forms

   Where: Chemistry: Accessioning desk where samples are received

   Who: Staff

   When: All times

   What: Includes following tasks:

   - Reviewing request forms
   - Making any changes or corrections on the forms
   - Preparing additional forms if necessary
   - Telephone physician or ward for more information
   - Notifying physician or ward of changes made

2. Accessioning Specimens

   Where: Chemistry: Accessioning area

   Who: Staff

   When: All times

   What: Includes following tasks:

   - Stamping numbers onto log sheets, taping numbers onto test tubes, writing number on requisition, writing patient information and tests requested on log sheet
   - Placing requisitions in appropriate holding boxes
   - Typing names for SMAC

3. Preparing Work Sheets

   Where: Chemistry: Near accessioning area or near test processing area

   Who: Staff

   When: Usually done before test processing but may be done during or after test processing

What: Includes the following tasks:

- Reviewing log sheet or requisitions to determine what tests must be done
- Selecting appropriate work sheet
- Writing accession number (and sometimes patient name) on worksheet
- Writing control information and other information

4. Test Processing

Where: Chemistry: At work areas where analyses are performed

Who: Staff

When: All Times

What: Includes the following tasks:

- Obtaining specimen from accessioning area and carrying it to work area
- Monitoring instruments
- Putting samples on instruments
- Working with sample or equipment

5. Performing Test Calculations

Where: Chemistry Laboratory: By either of the two calculators or hand calculations at the work area

Who: Staff

When: Throughout the day

What: Includes the following tasks:

- Using one of two calculators
- Performing test calculations by hand

6. Recording Test Results

Where: Chemistry: All work areas

Who: Staff

When: After processing tests

What: Includes following tasks:

- Writing results from equipment readouts onto worksheets
- Writing results of calculations onto work sheet
- Printing results by SMAC when a staff person is monitoring the printer
- Tearing off results from SMAC

7. Transcribing Test Results

Where: Chemistry work areas or chemistry accessioning areas

Who: Laboratory staff

When: All times

What: Includes following tasks:

- Writing results from worksheets onto test requisitions
- Stapling test requisitions onto SMAC printouts

8. Reporting Test Results

Where: Near accessioning area of chemistry

Who: Laboratory staff

When: After tests are completed

What: Includes following tasks:

- Selecting appropriate requisition from all others
- Calling the physician or nursing unit
- Reporting the test result on the telephone

NOTE: Reporting the test results to walk-in health care personnel would be recorded in Category #11, Responding to Inquiries.

9. Distributing Test Results

Where: Accessioning area in chemistry; also work area in front of SMAC

Who: Laboratory staff

When: After results are written onto the requisitions (or in the case of the SMAC printout, stapled onto the requisition)

What: Includes following tasks:

- Separating the requisitions into component parts
- Sorting the requisitions by patient area
- Correcting or completing requisitions

NOTE: Alphabetizing the requisitions would be reported in Category 10, Filing Test Results.

10. Filing Test Results

Where: Chemistry accessioning area; Chemistry SMAC area

Who: Laboratory staff

When: After results are written on requisitions

What: Includes following tasks:

- Alphabetizing copies of requisitions for pathology file

11. Responding to Inquiries on Test Status

Where: Accession area in chemistry

Who: Laboratory staff

When: Throughout the day

What: Includes following tasks:

- Answering the telephone (in response to a page from the receptionist's desk)
- Looking up test results from the patient's test requisition and reporting those results
- Searching the section log sheet to verify orders for test requests
- Reviewing the worksheets to determine status of test
- Checking verbally with staff to determine status of a test
- Looking up test results or test status for a walk-in health care provider

12. Compiling Workload Statistics

Where: Chemistry accessioning area

Who: Laboratory staff

When: Usually afternoons, may be done only once/week

What: Includes following tasks:

- Retrieving pervious days' accession logs and worksheets from files
- Counting number of laboratory tests and control samples done using any of the following:
  1) Accession log
  2) Worksheets
  3) Test requisitions
- Tallying the counts by type of test
- Recording the totals onto workload lists

13. Logging, Calculating, and Reporting Quality Control Information

    Where: Chemistry work areas

    Who: Laboratory staff

    When: Daily, sometimes weekly

    What: Includes following tasks:

    - Reviewing worksheets for quality control information
    - Recording test results for controls on separate list or worksheet
    - Calculating statistics for quality control (QC)
    - Recording results of QC analyses on charts or graphs

14. Administrative Handling of Incoming and Outgoing Test Specimens

    Where: Accessioning area

    Who: Laboratory staff

    When: All times

    What: Includes the following:

    - Writing accession number and patient information on record of samples being sent out
    - Comparing names on incoming specimens (from outside of hospital) with names on the inventory list

15. Other Nonproductive Work

    Where: Laboratory

    Who: Laboratory staff

    When: Throughout the day

    Where: Includes the following:

    - Socializing
    - Non-business use of telephone
    - Other nonproductive time

16. Other Productive Work

    Where: Laboratory

    Who: Laboratory staff

    When: Throughout the day

What: Includes the following:

- Business use of telephone
- Walking to work area to perform work
- Ordering supplies
- Mixing reagents
- Calibrating instruments
- Centrifuging blood specimens
- Discussion (D)
- Helping customer, either patient or medical staff (HC)
- Training (T)
- Cleaning laboratory area or equipment (C)
- Other productive time

17. Away from Area

Where: Out of sight of data collectors

Who: Chemistry staff

When: Throughout the day

What: Includes those times that chemistry personnel cannot be observed due to their being away from the laboratory and surrounding area (e.g., at lunch)

18. Maintaining Computer System and Instrument Interface

Any maintenance or adjustment of the TRILAB equipment, including the terminals, printers, and interface equipment for on-line instruments.

19. Accession

This activity includes the following functions, using any available terminal:

- Patient registration
- Request order entry
- Label generation

20. Worksheet Generation

This activity involves having the computer print "worksheets" --a listing of samples and tests to be performed on a given laboratory instrument.

1. Results Entry

   Keying in of results via terminal for instruments which are not on-line to the computer system.

2. Results Retrieval

   Looking up test results via terminal inquiry.

3. Results Review

   This includes the review of test results, usually by a supervisor, for approval prior to release to requesters.

4. Edit File

   This includes all file and program modifications.

5. Print Reports

   This includes the printing of reports or listings within the laboratory.

APPENDIX C-2

WORK SAMPLING ACTIVITIES

HEMATOLOGY SECTION

1. Verify/Correct Request Forms

   Where: Hematology: Accessioning bench where blood samples are received

   Urinalysis: Bench where urines are received and analyzed

   Who: Hematology and urinalysis staff

   When: All times

   What: Includes following tasks:

   - Reviewing request forms
   - Making any changes or corrections on the forms
   - Preparing additional forms if necessary
   - Telephoning physician or ward for more information
   - Notifying physician or ward of changes made

2. Accessioning Specimens

   Where: Hematology: Accessioning bench where blood samples are received

   Urinalysis: Bench where urines are received and analyzed

   Who: Hematology staff

   When: All times

   What: Includes following tasks:

   - Stamping numbers onto log sheets, taping numbers onto test tubes, writing number on requisition, writing patient information and tests required on log sheet
   - Placing requisitions in appropriate holding boxes

3. Preparing Work Sheets

   Where: Hematology: At accessioning area;
   Two benches near accession area where miscellaneous tests are performed;
   Bench near Coulter Counter

   Urinalysis: In urinalysis work area

Who: Hematology staff

When: All times

What: Includes following tasks:

- Reviewing log sheet or requisitions to determine what tests must be done
- Selecting appropriate worksheet
- Writing accession number (and sometimes patient name) on worksheet
- Writing control information and other information on worksheet

4. Test Processing

Where: Hematology: Work area
Urinalysis work area

Who: Laboratory staff

When: Throughout day

What: Includes following tasks:

- Mixing blood samples
- Preparing blood films (microscope slides)
- Staining blood films
- Working with blood sample
- Working with equipment for analysis. The Coulter S prints results directly onto the patient requisition. If a staff member is receiving a printout it should be marked under this category, test processing, not under recording.
- Examining blood under a microscope
- Working with urine samples
- Examining urine specimens under microscope
- Searching for specimens

5. Performing Test Calculations

Calculations are not usually performed in the hematology or urinalysis laboratory. If an occasional calculation is made, record it in the "comments" column.

6. Recording Test Results

   Where: Hematology and urinalysis work areas

   Who: Laboratory staff

   When: After processing tests

   What: Includes the following tasks:

   - Writing results from equipment readouts onto worksheets
   - Writing results of microscope examinations of blood films onto patient requisitions
   - Writing urinalysis test results onto patient requisitions
   - No recording of results should be noted with use of Coulter S

7. Transcribing Test Results

   Where: Hematology and urinalysis work areas

   Who: Hematology staff

   When: All times

   What: Includes following tasks:

   - Writing results from worksheets onto test requisitions

8. Reporting Test Results

   Where: Hematology and urinalysis work areas

   Who: Laboratory staff

   When: After tests are completed

   What: Includes following tasks:

   - Calling physician or nursing unit
   - Reporting test results from the requisition over the telephone

NOTE: Reporting test results to walk-in health care personnel would be recorded in Category #11, Responding to Inquiries.

9. Distributing Test Results

Where: Hematology and urinalysis work areas and accession area

Who: Laboratory staff

When: After results are written on requisitions

What: Includes following tasks:

- Separating the requisitions into component parts
- Sorting the requisitions by patient area
- Correcting or completing requisitions

NOTE: Alphabetizing the requisitions would be reported in Category 10, Filing Test Results.

10. Filing Test Results

Where: Hematology accessioning area
Hematology and urinalysis work areas

Who: Laboratory staff

When: After results are written on requisitions

What: Includes following tasks:

- Alphabetizing copies of requisitions for pathology file

11. Responding to Inquiries on Test Status

Where: Hematology accessioning area and all hematology and urinalysis work area

Who: Laboratory staff

When: Throughout the day

What: Includes following tasks:

- Answering the telephone (in response to a page from the receptionist's desk)
- Looking up test results from the patient's test requisition and reporting those results
- Searching the section log sheet to verify orders for test requests
- Reviewing the work sheets to determine status of test
- Checking verbally with staff to determine status of test
- Looking up test results on test status for a walk-in health care provider

12. Compiling Workload Statistics

Where: Hematology accessioning area
Hematology and urinalysis work areas

Who: Laboratory staff

When: Usually afternoons, may be done only once/week

What: Includes following tasks:

- Retrieving previous days' accession logs and worksheet from files
- Counting number of laboratory tests and control samples done using any of the following
  1) Accession log
  2) Worksheets
  3) Test requisitions
- Tallying the counts by type of test
- Recording the total onto workload lists

13. Logging, Calculating, and Reporting Quality Control Information

Where: Hematology accessioning area
Hematology and urinalysis work areas

Who: Laboratory staff

When: Daily, sometimes weekly

What: Includes following tasks:

- Reviewing worksheets for quality control information
- Recording test results for controls on separate list or worksheet
- Calculating statistics for quality control (QC)
- Recording results of QC analyses on charts or graphs

14. Administrative Handling of Incoming and Outgoing Test Specimens

Not applicable.

15. Other Nonproductive Work

Where: Laboratory

Who: Laboratory staff

When: Throughout day

What: Includes the following:

- Socializing
- Non-business use of telephone
- Other nonproductive time

16. Other Productive Work

Where: Laboratory

Who: Laboratory staff

When: Throughout day

What: Includes the following:

- Helping customer, either patient or medical staff
- Business use of telephone
- Walking to work area to perform work
- Ordering supplies
- Mixing reagents
- Calibrating instruments
- Cleaning laboratory area or equipment (C)
- Training (T)
- Other productive time
- Blood drawing (BD)
- Central Reception (CR)

17. Away from Area

Where: Out of sight of data collector

Who: Hematology staff

When: Throughout day

What: Includes those times that hematology personnel cannot be observed due to their being away from their laboratory and surrounding area (e.g., at lunch).

18. Maintaining Computer System and Instrument Interface

This activity includes any maintenance or adjustment of the TRILAB equipment, including the terminals, printers, and interface equipment for on-line instruments.

19. Accession

This activity includes the following functions, using any available terminal:

- Patient registration
- Request order entry
- Label generation

20. Results Entry

Keying in of results via terminal for instruments which are not on-line to the computer system.

22. Results Retrieval

    Looking up test results via terminal inquiry.

23. Results Review

    This includes the review of test results, usually by a supervisor, for approval prior to release to requesters.

24. Edit File

    This includes all file and program modifications.

25. Print Reports

    This includes the printing of reports or listings within the laboratory.

APPENDIX C-3

WORK SAMPLING ACTIVITIES

BACTERIOLOGY SECTION

!. Verify/Correct Request Forms

Where: Bacteriology: Accessiong desk by main door where bacteriology specimens are received

Serology/Parasitology: Small room across hall from bacteriology at the desks where specimens and blood samples are received

Who: Bacteriology staff

When: All times

What: Includes following tasks:

- Reviewing request forms
- Making any changes or corrections on the forms
- Preparing additional forms if necessary
- Telephoning physician or ward for more information
- Notifying physician or ward of changes made

1. Accessioning Specimens

Where: Bacteriology Desk by front door where specimens are received

Serology/Parasitology: Small room across hall from bacteriology

Who: Bacteriology staff

When: All times

What: Includes following tasks:

BACTERIOLOGY

- Matching patient requisition to labels in log book (occurs about 1500-1630)
- Writing accession number on label
- Writing accession number on requisition

- Writing patient information on labels
- Putting labels into large notebook (book is usually located by far wall in main bacteriology room)
- Writing accession number on original sample (does not include writing number on culture media)
- Writing patient information into PKU notebook

SEROLOGY/PARASITOLOGY

- Writing accession numbers on log sheet or in notebook
- Writing accession number on request form
- Writing accession number on blood sample or parasitology specimen
- Writing patient information on log sheet or in notebook

3. Preparing Worksheets

Where: Bacteriology: Worksheets are not used
Serology/Parasitology: Any work area

Who: Bacteriology staff

When: All times

What: Includes following tasks:

- Reviewing log sheet or requisitions to determine what tests must be done
- Selecting appropriate worksheet
- Writing accession number (and sometimes patient name) on worksheet
- Writing control information and other information on worksheet

4. Test Processing

Where: Bacteriology laboratory main room and accessioning area

Who: Laboratory staff

When: Throughout day

What: Includes following tasks:

- Innoculating culture media with specimen in the bacteriology accessioning area
- Examining culture media
- Writing notes and reports on the back of the patient requisition (writing on the front side is Activity #6)
- Working with culture media
- Examining stains under the microscope
- Staining slides
- In the serology/parasitology room any handling of specimens except discarding samples should be regarded as test processing
- Examining specimens under microscope

5. Performing Test Calculations

Calculations are not usually performed in the bacteriology or serology/parasitology laboratories. If you see an occasional calculation, record it in this category.

6. Recording Test Results

Where: Bacteriology and serology/parasitology work areas

Who: Laboratory staff

When: All times

What: Includes following tasks:

- Writing results of cultures onto front of patient requisition
- Writing results of specimen gram stains onto worksheet
- Writing results of sensitivity tests (usually read from large culture plate with many small white discs on it)
- Writing results of serology tests into notebook or log sheet

7. Transcribing Test Results

   Where: Bacteriology and serology/parasitology work areas

   Who: Laboratory staff

   When: All times

   What: Includes following tasks:

   - Writing results from worksheets onto test requisitions (occurs primarily in the serology/parasitology area)
   - Writing gram stain results from sheets onto test requisitions (occurs near the microscope in the main bacteriology laboratory)

8. Reporting Test Results

   Where: Bacteriology and serology/parasitology work areas

   Who: Laboratory staff

   When: All times

   What: Includes following tasks:

   - Reporting results of gram smears by phone to physician or nursing unit
   - Calling physician about a positive blood culture or spinal fluid (positive means that some bacteria is growing in the culture)

9. Distributing Test Results

   Where: Bacteriology and serology/parasitology work areas

   Who: Laboratory staff

   When: After results are written on requisitions

   What: Includes following tasks:

   - Separating the requisitions into component parts
   - Sorting the requisitions by patient area
   - Correcting or completing requisitions

NOTE: Alphabetizing the requisition would be reported in Category #11, Filing Test Results

10. Filing Test Results

    Where: Bacteriology and serology/parasitology work areas and bacteriology accessioning area

    Who: Laboratory staff

    When: After results are written on requisitions

What: Includes following tasks:

- Alphabetizing copies of requisitions for pathology file

11. Responding to Inquiries on Test Status

Where: Bacteriology accessioning area and all bacteriology and serology/parasitology work areas

Who: Laboratory staff

When: Throughout the day

What: Includes following tasks:

- Answering the telephone (in response to a page from the receptionist's desk
- Looking up test results from the patient's test requisition and reporting those results
- Searching the section log sheet to verify orders for test requests
- Reviewing the worksheets to determine status of test
- Checking verbally with staff to determine status of a test
- Looking up test results or test status for a walk-in health care provider

12. Compiling Workload Statistics

Where: Bacteriology and serology/parasitology work areas

Who: Laboratory staff

When: Usually afternoons, may be done only once/week

What: Includes following tasks:

- Retrieving previous days' accession logs and worksheets from files
- Counting number of laboratory tests and control samples done using any of the following:
  1) Accession log
  2) Worksheets
  3) Test requisitions
- Tallying the counts by type of test
- Recording the totals onto workload lists

13. Logging, Calculating, and Reporting Quality Control Information

Where: Bacteriology and serology/parasitology work areas

Who: Laboratory staff

When: Daily, sometimes weekly

What: Includes following tasks:

- Reviewing worksheets for quality control information
- Recording test results for controls on separate list or worksheet
- Calculating statistics for quality control (QC)
- Recording results of QC analyses on charts or graphs

14. Administrative Handling of Incoming and Outgoing Test Specimens

Where: Accessioning area

Who: Laboratory staff

When: All times

What: Includes the following:

- Writing accession number and patient information on record of samples being sent out
- Comparing names on incoming specimens (from outside of hospital) with names on the inventory list

15. Other Nonproductive Work

Where: Laboratory

Who: Laboratory staff

When: Throughout day

What: Includes the following:

- Socializing
- Non-business use of telephone
- Other nonproductive time

16. Other Productive Work

NOTE: Describe productive activity in "comments" column

Where: Laboratory

Who: Laboratory staff

When: Throughout day

What: Includes the following:

- Business use of telephone
- Walking to work area to perform work
- Ordering supplies
- Mixing reagents
- Calibrating instruments
- Discussion
- Helping customer, either patient or medical staff (HC)
- Training
- Cleaning laboratory area or equipment (C)
- Other productive time

7. Away From Area

Where: Out of sight of data collector

Who: Bacteriology and serology/parasitology staff

When: Throughout the day

What: Includes those times that bacteriology and serology/parasitology personnel cannot be observed due to their being away from the laboratory and surrounding area (e.g., at lunch)

8. Maintaining Computer System and Instrument Interface

This activity includes any maintenance or adjusting of the TRILAB equipment, including the terminal, printers, and interface equipment for on-line instruments.

9. Accession

This activity includes the following functions, using any available terminal:

- Patient registration
- Request order entry
- Label generation.

10. Worksheet Generation

This activity involves having the computer print "worksheets"--a listing of samples and tests to be performed on a given laboratory instrument.

21. Results Entry

Keying in of results via terminal for instruments which are not on-line to the computer system.

22. Results Retrieval

Looking up test results via terminal inquiry.

23. Results Review

This includes the review of test results, usually by a supervisor, for approval prior to release to requesters.

24. Edit File

This includes all file and program modifications.

25. Print Reports

This includes the printing of reports or listings within the laboratory.